abstract

The advancements in additive manufacturing have made it possible to bring to life designs that would otherwise exist only on paper. An excellent example of such designs is the Triply Periodic Minimal Surface structures like Schwarz D, Schwarz P, Gyroid, etc. These structures are self-sustaining, i.e. they require minimal supports or no supports at all when 3D printed. These structures exist in stable form in nature, like butterfly wings are made of Gyroids. Automotive and aerospace industry have a growing demand for strong and light structures, which can be solved using TPMS models. In this research we will try and understand some of the properties of these TPMS structures and see how they perform in comparison to the conventional models. This research was concentrated on the mechanical, thermal and fluid flow properties of the Schwarz D, Gyroid and Spherical Gyroid TPMS models in particular other TPMS models were not considered. A detailed finite element analysis was performed on the mechanical and thermal properties using ANSYS 19.2 and the flow properties were analyzed using ANSYS Fluent under different conditions.